

**Summary Minutes of the  
U.S. Environmental Protection Agency (EPA)  
Clean Air Scientific Advisory Committee (CASAC) Lead Review Panel  
Public Meeting, April 10-11, 2012**

Date and Time: Tuesday, April 10, 2012, 8:30 am – 5:30 pm; Wednesday, April 11, 2012, 8:30 am – 12:00 pm ET.

Location: Marriott at Research Triangle Park Hotel, 4700 Guardian Drive, Durham, North Carolina 27703

Purpose: The purpose of the April 10-11, 2012 public meeting was for the CASAC Lead Review Panel to conduct a peer review of EPA's *Integrated Science Assessment for Lead* (Second External Review Draft - February 2012).

Participants:

CASAC Lead Review Panel (See Roster, Attachment A):

Dr. H. Christopher Frey, Chair  
Mr. George A. Allen  
Dr. Herbert Allen  
Dr. Richard Canfield  
Dr. Deborah Cory-Slechta  
Dr. Cliff Davidson  
Dr. Philip E. Goodrum  
Dr. Sean Hays  
Dr. Philip Hopke  
Dr. Chris Johnson  
Dr. Susan Korrick  
Dr. Michael Kosnett  
Dr. Roman Lanno  
Mr. Richard L. Poirot  
Dr. Joel Pounds  
Dr. Michael Rabinowitz  
Dr. William Stubblefield  
Dr. Ian von Lindern  
Dr. Gail Wasserman  
Dr. Michael Weitzman

Two Panel members (Drs. Sean Hays and Dr. Michael Weitzman) participated via teleconference.

|                |   |
|----------------|---|
| EPA SAB Staff: | Mr. Aaron Yeow, Designated Federal Officer (via telephone)        |
|                | Mr. Edward Hanlon, Designated Federal Officer                     |
|                | Dr. Vanessa Vu, Director, EPA Science Advisory Board Staff Office |

EPA Staff: Ms. Lydia Wegman, EPA Office of Air Quality  
Planning and Standards (OAQPS)  
Dr. Deirdre Murphy, OAQPS  
Mr. Kevin Cavender, OAQPS  
Dr. Zachary Pekar, OAQPS  
Dr. Robert Vanderpool, EPA Office of Research and  
Development (ORD)  
Dr. Marion Hoyer, EPA Office of Transportation and Air  
Quality  
Dr. John Vandenberg, ORD  
Dr. Ellen Kirrane, ORD

Other Attendees: A list of members of the public who attended or  
requested information for calling into the meeting  
is provided in Attachment B, Public Attendance.

Materials Available: The agenda and meeting materials were circulated to the CASAC Lead Review Panel in advance of the meeting, and were made available to the public via the CASAC website ([www.epa.gov/casac](http://www.epa.gov/casac)) on the following CASAC Lead Review Panel website:  
<http://yosemite.epa.gov/sab/sabproduct.nsf/bf498bd32a1c7fdf85257242006dd6cb/5a62d5e08354305c8525796700537c13!OpenDocument&Date=2012-04-10>

### **Meeting Summary**

The meeting was announced in the Federal Register<sup>1</sup> and proceeded according to the meeting agenda<sup>2</sup>. A summary of the meeting follows.

### **April 10, 2012**

#### **Opening Statements and Welcome**

Mr. Edward Hanlon, an SAB Designated Federal Officer (DFO), opened the meeting, and made a brief opening statement noting that the CASAC Lead Review Panel is a Federal Advisory Committee under the Federal Advisory Committee Act (FACA). He noted that Aaron Yeow is the DFO for the Panel but was not able to attend this meeting. He stated that the meeting was open to the public and that Agency-provided briefing materials were posted onto the meeting website. He stated the purpose of the meeting, and noted that no members of the public had either requested to present an oral statement during the meeting or submitted written public comments. He noted that the SAB Staff Office has determined that there were no conflict-of-interest or appearance of a lack of impartiality issues for any Panel members for this review. He also noted that minutes of the meeting were being taken to summarize discussions and action items in accordance with requirements under FACA. Dr. Vanessa Vu, Director of the SAB Staff Office, welcomed everyone and expressed appreciation to the Panel and to the EPA staff for their support in preparing for the meeting.

Dr. H. Christopher Frey, Chair of the Panel, then welcomed everyone and requested that all members introduce themselves. Dr. Frey noted that EPA would be presenting throughout most of the morning, and that after EPA's presentations, the Panel would start review of Chapter 3 and proceed from that point. Dr. Frey stated that Lead Discussants should plan to take notes during

the April 10 meeting discussion and capture key points, collate their points in writing the evening of April 10, and send Dr. Frey and Mr. Hanlon their summary of key preliminary responses to each charge question the evening of April 10 for discussion at the April 11 meeting. Dr. Frey noted that Lead Discussants should also include the top three or so suggested bullet points that would summarize a paragraph to be drafted for each charge question response; this paragraph would be included within the approximately two-three page letter to the Administrator that would accompany the CASAC report.

Dr. Frey stated that Panel members could adjust their individual preliminary comments after the meeting, and submit their final individual member comments within two weeks (by April 24). He also noted that Lead Writers should submit their draft consensus responses and key points within three weeks (by May 1). Dr. Frey also noted that the Panel would develop a written report to the EPA Administrator that reflects the Panel's advice to EPA, and that the report would include a cover letter that summarizes key points of the CASAC review, consensus responses to each charge question, and individual Panel member comments. He noted the Panel would have a teleconference to discuss the draft CASAC report that would subsequently be sent to the EPA Administrator.

## **EPA Presentations**

Ms. Lydia Wegman, EPA OAQPS, made a brief opening statement and presented and discussed her PowerPoint slides<sup>3</sup> (slides 1-3) that were provided on the meeting website. Following Ms. Wegman, Dr. Deirdre Murphy and Mr. Kevin Cavender, OAQPS, then presented and discussed their PowerPoint slides<sup>3</sup> (slides 4-6 and 7-12, respectively). One Panel member asked how ambient air was monitored at airports, and EPA responded that areas within the fenceline of airports were covered. Another Panel member asked whether all monitoring dates occurred as scheduled. EPA responded that the 2010 monitoring results were all publicly available, and that 2011 monitoring results were still being completed and were undergoing quality assurance review. One Panel member asked what is the quality of data and modeling that EPA used to support the waiver determination. EPA responded that modeling and monitoring requirements were specified in the U.S. Code of Federal Regulations (CFR).

Dr. Robert Vanderpool then presented and discussed his PowerPoint slides<sup>3</sup> (slides 13-34). Several Panel members asked various questions regarding EPA's lead monitoring and modeling requirements, including questions on quality assurance, particle size requirements, manufacturer capabilities, available analytical techniques, and analytical and sampling development. Dr. Vanderpool, Mr. Cavender and Mr. Marion Hoyer of EPA responded to these questions.

Drs. John Vandenberg and Ellen Kirrane then presented and discussed their PowerPoint slides<sup>4</sup> (slides 1-5 and 6-29, respectively). Several Panel members asked various questions regarding the content of the updated Lead Integrated Science Assessment (ISA) Report, which EPA responded to. A few Panel members requested more detail on EPA's efforts to respond to the advice provided in the previous CASAC Report, noting that EPA could be more specific in identifying which CASAC advice and comments were addressed and not addressed. EPA responded that it considered all advice and comments, and hesitates to commit to preparing a point by point response.

Dr. Frey noted that no members of the public had requested to present an oral statement during the meeting and asked whether there were any members of the public who wanted to present oral comments. Upon hearing no requests from the public to present oral comments, Dr. Frey moved

forward with Panel responses to the Charge Questions.

### **Chapter 3 – Source to Concentration**

The Panel discussed the adequacy of EPA's changes to Chapter 3, and provided recommendations to improve the discussion in Chapter 3 of EPA's report. In general, the Panel noted that the current draft EPA report was substantially improved over the earlier draft Report. Several Panel members noted they would submit more detailed comments regarding this chapter for EPA's consideration.

The Panel noted that EPA's expanded description of the total suspended particulates (TSP) Federal Reference Method (FRM) FRM and related sampling methods had substantial new and helpful content in response to the CASAC's advice on the first draft ISA, particularly regarding the current FRM high volume sampling method. The Panel recommended that EPA expand the discussion on the state of aerosol science that supports possible alternatives to the high volume FRM.

The Panel also noted that EPA should reinsert the EPA Air Quality System (AQS) data for ambient air lead particle size information, and address comments raised in the earlier CASAC report. Several Panel members suggested that EPA refer to an EPA memorandum written by Cavender and Schmidt on lead particle sizes in this analysis, and noted it would be helpful if EPA prepared a literature review update on this topic. The Panel also commented that it would be helpful if EPA provided estimates of policy relevant background (PRB) for air lead. The Panel recommended that EPA provide additional synthesis of literature results to improve readability of some sections of the Report.

The Panel discussed application of the Pearson and Spearman rank-ordered correlation coefficient analyses and results, and the appropriateness of applying these measures. The Panel noted that the Spearman rank alone is a measure of the monotonicity of the relationship between two random variables. Other types of correlations, such as the Pearson correlation, measure the linearity of covariation between two random variables. EPA should consider also presenting or evaluating the Pearson or other parametric methods. The Panel suggested that EPA improve data usability by clearly linking data with source identification. The Panel further suggested that EPA link the Chapter 4 discussion of exposures with Chapter 3 discussion on air measurements (e.g., on the wood smoke topic). Regarding wood smoke, the Panel suggested that EPA discuss avoidable lead exposures from residential space heating woodsmoke since this may be the primary air exposure pathway for "new" lead in rural or small valley towns where woodsmoke particulate matter (PM) concentrations are high.

The Panel noted that three primary points for the cover letter to the Administrator would be: a) all data on lead size is useful since there were limited available lead data; b) improve the linkage between chapters 3 and 4; and c) provide additional details on how to develop a new TSP low-volume lead FRM sampler.

Several Panel members also suggested that EPA include more details on sources, fate, and distribution of lead across the United States, and consider conducting some form of a material balance distillation. One Panel member suggested that EPA list the top twenty or so largest sources of lead and note where airports fit in that listing.

### **Chapter 4 – Exposure, Toxicokinetics and Biomarkers**

The Panel discussed EPA's interpretation of the science, description and presentation of uncertainties and limitations of relevant data, and methodologies and approaches, and noted several recommendations to improve the discussion in Chapter 4 of EPA's report. The Panel noted that EPA should provide additional synthesis and summary of information on Section 4.1's exposure assessment discussion, and further describe the importance and impact of the reviewed data to the ISA. The Panel noted that Section 4.1.1 should include a table that summarizes information presented in this section and distinguish between estimates based on modeling (e.g., IEUBK) and empirical studies. Several Panel members recommended that EPA generally enhance the text discussions throughout the entire report that describe figures and tables. The Panel also recommended that EPA synthesize/summarize this information and discuss the importance of changes in percent contribution estimates over time or as a function of the low end vs. high end blood lead levels.

The Panel recommended that EPA prepare an uncertainty analysis on the relationship between blood lead and air lead levels/slopes, and suggested that EPA demonstrate how a particular slope factor translates into a corresponding change in blood lead levels for particular scenarios under the IEUBK model. Regarding the log-log, log-linear, and other model selection, the Panel recommended that EPA discuss the low end of the air lead ranges presented in the report and discuss the magnitude of difference in estimates and representativeness of the statistical models applied to empirical data. The Panel also recommended that EPA discuss the measurement errors for historical lead TSP measurements and how these errors affect the estimates of air/blood lead levels and estimates of predicted blood lead from epidemiological data.

The Panel noted that EPA should enhance the discussion on sources of lead over time, how the changes in lead sources relate to changes in blood lead levels, and how reductions in source emissions from other than gasoline lead phase down have affected such blood lead levels, particularly in the vicinity of point sources. The Panel also noted that EPA should clarify several apparent contradictions within the Report, including contradictions on the clearance rates for blood lead levels and the percentages of body burden in blood.

A Panel member suggested that EPA consider assessing lead data from other countries in addition to the data EPA assessed from United States, Australia and New Zealand. Another Panel member suggested that EPA assess relative source contribution to reductions indicated in blood lead level data. A few Panel members recommended that EPA's exposure discussion consider how lead particle size affects exposure and absorption.

## **Chapter 5 – Integrated Health Effects**

The Panel discussed the weight of evidence for endpoints within a major outcome category and the adequacy with which evidence has been integrated between toxicological and epidemiologic studies. The Panel also discussed weight of evidence regarding blood and bone lead levels and their link to various health effects described in epidemiologic studies. The Panel agreed that while the revised draft for Chapter 5 incorporates a number of important improvements and was greatly improved, the Chapter should be revised in various areas.

The Panel recommended that EPA further assess each study reviewed to determine the strength of the observed associations, and improve the transparency in discussions regarding causal determination. The Panel also recommended that EPA improve the clarity in the discussions on behavioral outcomes.

The Panel noted that homologies of animal behavior tests to human tests were correct in some cases but incorrect in others. The Panel noted that while the Chapter implied that there was similar strength of literature relating lead effects on childhood cognition versus behavior, these literature are not similarly robust. The Panel recommended that the discussion on renal outcomes be improved to address reverse causation, inconsistencies and uncertainties in the literature, and the lack of a mechanism for renal effects at blood lead levels below 15 µg/dL. The Panel also suggested that EPA clarify the exposure levels at which observed effects are likely to occur, and studies of null associations where they exist in the literature.

A Panel member noted that while there is incredibly rich literature for lead assessment, such literature significantly varies in quality and the Report should recognize limitations of literature referenced in the Report. Another Panel member noted that it seemed that there were frequent sections of the Chapter that were incomprehensible due to cutting and pasting of text, and recommended that a technical editor unassociated with the project review and revise the discussion to improve the clarity.

Several Panel members expressed concern regarding the clinical Attention Deficit Hyperactivity Disorder (ADHD) diagnosis described in the Report, noting it was inappropriate for EPA to tag ADHD to an actual diagnosis without a supporting clinical study. Several Panel members also noted that the chapter's discussions on weight of evidence linking lead exposure to Intelligence Quotient (IQ) levels, self esteem, and various other behavioral, cognitive, and physical aspects was confusing and should be improved.

## **Chapter 6 – Potentially At-Risk Populations**

The Panel discussed the adequacy of EPA's revisions to clarify the consideration of potential at-risk populations, and recommended certain revisions to improve the characterization of key findings and scientific conclusions. The Panel also commented on whether EPA's discussion on some factors with limited evidence adequately reflected the knowledge base considered and strength of evidence available. The Panel agreed that the revised draft for Chapter 6 provided an improved discussion that better captures the intricacies associated with 'at risk' populations, and was more cohesive and better integrated than the earlier draft.

The Panel noted that EPA should discern which risk factors are most critical in modifying the magnitude of the impacts of lead exposure. The Panel cautioned that EPA should qualify the homology between maternal self-esteem vs. stress imposed in rat models. The Panel also noted that EPA should reinterpret the Wang and Fowler study.

Several Panel members recommended that EPA should improve the evaluation on whether gender is an important risk factor associated with lead exposure. A Panel member also expressed concern that the Report noted that fluoridation of drinking water causes increase in lead exposure, and suggested that EPA reevaluate this discussion and analysis.

## **Chapter 7 – Ecological Effects of Lead**

The Panel discussed the improvements made to this chapter, and noted this chapter was greatly improved through EPA's reorganization efforts and addition of material. The Panel noted that EPA's clarification to sections, addition of concise introductions, and inclusion of updated information on lead exposure, toxicity, and effects to ecological receptors were helpful. The

Panel recommended that EPA further evaluate, summarize and integrate the data and information in the Report, and generate summary tables of media-based exposure concentrations, dose-responses and modifying factors to assist in this analysis. The Panel also suggested that EPA express terms consistently throughout the report, and commented that survival, growth, and reproduction should be considered the most relevant endpoints, with sub-organismal responses should be discussed in the context of secondary responses. The Panel further noted that EPA should clarify causal determinations of ecological responses.

A Panel member suggested that EPA include median concentrations in the data presentation, and include caveats regarding interpretation of various papers presented or referenced in the Report. Another Panel member requested that EPA assess how ecosystem services prevent lead from being released into the environment, and the link between lead exposures and effects in terrestrial and aquatic systems. One Panel member suggested that EPA consider saltwater fish data in its analysis.

One Panel member suggested that EPA further clarify the relationship between concentration data to population effects, and another Panel member recommended that EPA list the most sensitive species affected by lead exposures. Several Panel members recommended that EPA further clarify and reference the basis for endpoints discussed in the Report.

### **Preface, Preamble, Chapters 1 (Executive Summary) and 2 (Integrative Summary)**

The Panel discussed the extent to which the discussion of the health effects evidence in Chapters 1 and 2 reflected the revisions to Chapter 5. The Panel noted that EPA's revised draft appropriately recognizes that adverse effects of lead in adults cannot confidently be imputed to contemporary blood lead concentrations. The Panel noted that these Chapters could be improved through a substantial revision that focuses on specific health endpoints as opposed to organ system effects, and assesses the weight of the evidence for causation after systematically and critically evaluating the data. The Panel stated that the data should be evaluated for strength of study designs, consistency in terms; the extent to which associations arising from chance, bias, or confounding may be ruled out with reasonable confidence; demonstration of a dose-response; and biological plausibility at low dose.

The Panel also noted that the causation analysis for behavioral outcomes in children and renal outcomes needed improvement, and commented that behavioral outcomes in children should be distinguished from effects on cognitive function. The Panel also commented that longterm (i.e., decades) of blood lead levels across the range of 10 to 25 µg/dL probably bear a causal relationship to an increased risk of adverse cardiovascular endpoints (increased BP, hypertension, CV mortality) in adults. The Panel further recommended that EPA should focus the discussion on public health significance of low level lead exposure towards the endpoints of cognitive decrements in children and adverse cardiovascular effects in adults. The Panel further mentioned that an increased risk of elevated lead exposure associated with fluoridation of public water supply systems has not been established, and reference to such a relationship should be omitted from the text in the absence of sufficient relevant evidence

One Panel member recommended that EPA clarify how to determine safe atmospheric concentrations of lead that people are exposed to. Another Panel member suggested that EPA consider use of non-peer reviewed studies on lead use, consumption, and disposal since these topics are not generally well covered in peer reviewed studies. The Panel member also suggested that EPA not limit data that was assessed in the report to certain geographic locations,

and that there were significant lead exposure occurring in countries other than the United States. One Panel member noted that there is a statutory mandate that restricts the focus to the National Ambient Air Quality Standards (NAAQS) review process. EPA staff responded that the Lead ISA was drafted to support NAAQS, and that it was not a global science assessment although the document would be used globally. A Panel member suggested that EPA add a page to acknowledge there are other efforts that EPA has been involved in that address lead exposure issues that were not covered through the NAAQS process.

### **April 11, 2012**

Dr. Zachary Pekar (OAQPS) made a brief opening statement and presented and discussed his PowerPoint slides<sup>6</sup> that were provided on the meeting website. Questions raised by Panel members were responded to by EPA. One Panel member asked whether EPA would develop a qualitative or quantitative uncertainty assessment, and requested information on the scope of EPA's aviation gasoline scenario. Dr. Pekar responded that EPA expected to develop a qualitative and potentially semi-quantitative assessment during its assessment of additional exposure pathways. Dr. Pekar also noted that the aviation gasoline scenario would characterize urban exposures, and that various inhalation influences to blood lead levels to humans exposed near airports would be considered.

Another Panel member asked whether EPA could differentiate whether the air pathway is minor relative to other pathways. Dr. Pekar responded that there was uncertainty regarding whether soil lead levels result in increases in the importance of ambient air risk. Dr. Murphy noted that EPA is interested in impacts of air lead, and that there were significant complexities associated with assessing risks associated with atmospheric deposition onto soils and crops.

The Panel discussed uncertainties of Geometric Standard Deviations (GSD) when estimating blood lead concentration, and various factors that would influence the IEUBK model results based on GSD.

Dr. Frey solicited requests from the public to make clarifying comments; hearing no such requests, Dr. Frey opened the discussion to any other topics that the Panel wanted to raise. One Panel member noted there is no substantial new evidence that would warrant EPA reassessment of lead dose response levels related to IQ. Dr. Frey noted that EPA was developing new analytical methods for ambient lead, which CASAC could provide advice on. He also noted that another CASAC panel (Air Monitoring and Methods Subcommittee - AMMS) is better constituted to provide advice on ambient monitoring issues, and that the letter to the Administrator providing CASAC advice on the second draft lead ISA could reflect this view.

### **Summary of April 10 Discussions:**

Dr. Frey projected onto the meeting screen a list of preliminary key summary points that Panel members drafted to summarize the April 10, 2012 meeting discussions<sup>5</sup>, and requested that Panel members who were lead discussants for each charge question discuss the preliminary key points. Dr. Frey asked the Panel to also consider whether the preliminary summary points responded to each charge question, and whether there were certain key points that should be included in the letter to the Administrator. Mr. Hanlon noted these preliminary summary points would be posted onto the SAB meeting website soon after the meeting. The Panel discussed each set of preliminary key summary points, and changes to each set of preliminary key summary points were suggested. Dr. Frey requested that Lead Writers from the Panel take notes and keep track



of suggested changes to the preliminary key summary points and incorporate these suggested changes into text that would comprise the draft CASAC report that would be developed after the meeting. Dr. Frey noted that the Panel should plan to send Aaron Yeow their updated individual Panel member preliminary comments by April 25<sup>th</sup>, and by May 2, the Panel's Lead Writers should send Aaron draft responses to the charge questions and draft bullets for the cover letter.

The Panel further discussed its recommendations regarding the use of design vs. performance-based samplers, and outlined suggestions to move forward. The Panel also discussed which slope factor should be used in the ISA, and noted that it would be appropriate to provide a critique on EPA's preferred slope factor(s) and an assessment on the robustness of the literature that support those slope factor(s). The Panel further discussed causality and weight of evidence and relevant literature on those topics. The Panel generally noted that EPA's causal determination framework appeared reasonable, but that the text should be more transparent and further and consistent evaluation of evidence of causation was recommended.

The Panel also recommended that EPA particularly focus on revising Chapter 5 and suggested that EPA provide expert editing and text revisions to characterize and clarify effects. The Panel noted that EPA's discussion on behavioral effects and attention span was superficially covered, and recommended that EPA improve its assessment of behavioral functions. The Panel noted it would consider which particular expertise areas were deficient in the current ISA. The Panel also discussed additional recommendations regarding EPA's discussion on ADHD, and further discussed its recommendations regarding the ISA draft text on fluoridation in water systems

The Panel noted that Chapter 7 should include a summary section that outlines the findings of this chapter, and noted that EPA should consider including more analysis in the appendix.

At 11:40 am, one Panel member experienced a medical emergency, and the meeting was temporarily suspended. At 11:55 am, the Designated Federal Officer adjourned the meeting, noting that Panel members would receive an email after the meeting that would outline next steps.

Respectfully Submitted:

*/signed/*

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Mr. Edward Hanlon  
Designated Federal Officer

Certified as Accurate:

*/signed/*

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Dr. H. Christopher Frey, Chair  
CASAC Lead Review Panel

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by Panel members during the course of deliberations within the meeting. Such ideas, suggestions and deliberations do not necessarily reflect consensus advice from the Panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters or reports prepared and transmitted to the EPA Administrator following the public meetings or teleconferences.

## Materials Cited

The following meeting materials are available on the CASAC website ([www.epa.gov/casac](http://www.epa.gov/casac)) on the following CASAC Lead Review Panel website:

<http://yosemite.epa.gov/sab/sabproduct.nsf/bf498bd32a1c7fdf85257242006dd6cb/5a62d5e08354305c8525796700537c13!OpenDocument&Date=2012-04-10>

<sup>1</sup> Federal Register Notice announcing the public meeting

<sup>2</sup> Agenda for April 10-11, 2012 public meeting

<sup>3</sup> EPA Presentation - Review of the National Ambient Air Quality Standards (NAAQS) for Lead  
- Updates for Lead NAAQS Review Panel of the Clean Air Scientific Advisory Committee

<sup>4</sup> EPA Presentation - Presentation of Revisions to the Draft Integrated Science Assessment for Lead

<sup>5</sup> Preliminary list of key summary points from April 10, 2012 meeting discussions

<sup>6</sup> EPA Presentation - Exposure and Risk Information in Policy Assessment

## **ATTACHMENT A – ROSTER**

### **U.S. Environmental Protection Agency Clean Air Scientific Advisory Committee CASAC Lead Review Panel**

#### **CHAIR**

**Dr. H. Christopher Frey**, Professor, Department of Civil, Construction and Environmental Engineering, College of Engineering, North Carolina State University, Raleigh, NC

#### **MEMBERS**

**Mr. George A. Allen**, Senior Scientist, Northeast States for Coordinated Air Use Management (NESCAUM), Boston, MA

**Dr. Herbert Allen**, Professor Emeritus, Department of Civil and Environmental Engineering, University of Delaware, Newark, DE

**Dr. Richard Canfield**, Senior Research Associate, Division of Nutritional Sciences, Cornell University, Ithaca, NY

**Dr. Deborah Cory-Slechta**, Professor, Department of Environmental Medicine, School of Medicine and Dentistry, University of Rochester, Rochester, NY

**Dr. Cliff Davidson**, Professor, Civil and Environmental Engineering, Syracuse University, Syracuse, NY

**Dr. Philip E. Goodrum**, Senior Consultant, Cardno ENTRIX, Syracuse, NY

**Dr. Sean Hays**, President, Summit Toxicology, Allenspark, CO

**Dr. Philip Hopke**, Bayard D. Clarkson Distinguished Professor, Department of Chemical and Biomolecular Engineering, Clarkson University, Potsdam, NY

**Dr. Chris Johnson**, Professor, Department of Civil and Environmental Engineering, Syracuse University, Syracuse, NY

**Dr. Susan Korrick**, Assistant Professor of Medicine, Department of Medicine, Brigham and Women's Hospital, Channing Laboratory, Harvard Medical School, Boston, MA

**Dr. Michael Kosnett**, Associate Clinical Professor, Division of Clinical Pharmacology and Toxicology, Department of Medicine, University of Colorado Health Sciences Center, Denver, CO

**Dr. Roman Lanno**, Associate Professor and Associate Chair, Department of Evolution, Ecology, and Organismal Biology, Ohio State University, Columbus, OH

**Mr. Richard L. Poirot**, Environmental Analyst, Air Pollution Control Division, Department of Environmental Conservation, Vermont Agency of Natural Resources, Waterbury, VT

**Dr. Joel G. Pounds**, Laboratory Fellow, Cell Biology & Biochemistry, Biological Sciences Division, Pacific Northwest National Laboratory, Richland, WA

**Dr. Michael Rabinowitz**, Geochemist, Marine Biological Laboratory, Newport, RI

**Dr. William Stubblefield**, Senior Research Professor, Department of Molecular and Environmental Toxicology, Oregon State University, Corvallis, OR

**Dr. Ian von Lindern**, President, TerraGraphics Environmental Engineering, Inc., Moscow, ID

**Dr. Gail Wasserman**, Professor of Clinical Psychology in Child Psychiatry, Division of Child and Adolescent Psychiatry, College of Physicians and Surgeons, Columbia University, New York, NY

**Dr. Michael Weitzman**, Professor, Pediatrics; Psychiatry, New York University School of Medicine, New York, NY

#### **SCIENCE ADVISORY BOARD STAFF**

**Mr. Aaron Yeow**, Designated Federal Officer, U.S. Environmental Protection Agency, Science Advisory Board (1400R), 1200 Pennsylvania Avenue, NW, Washington, DC, Phone: 202-564-2050, Fax: 202-565-2098, (yeow.aaron@epa.gov)

**Mr. Edward Hanlon**, Designated Federal Officer, U.S. Environmental Protection Agency, Science Advisory Board (1400R), 1200 Pennsylvania Avenue, NW, Washington, DC, Phone: 202-564-2134, Fax: 202-565-2098, (hanlon.edward@epa.gov)

## **ATTACHMENT B – Public Attendance**

### **List of Members of the Public Who Attended or Requested Information for Calling into the Public Meeting is Provided Below:**

**April 10-11, 2012**

| <b>Name</b>          | <b>Affiliation</b> |
|----------------------|--------------------|
| Bhave, Prakash       | EPA                |
| Boreino, Craig       | ILZRO              |
| Brown, James         | EPA                |
| Cavendar, Kevin      | EPA                |
| Dart, Andrew         | RTI                |
| Datko, Laura         | EPA                |
| Davis, Allen         | EPA                |
| Dolpe, Rosalind      | ILZRO              |
| Dzubow, Rebecca      | EPA                |
| Farquharson, Chenise | EPA                |
| Hendrinson, Eric     | NRG                |
| Hoyer, Marion        | EPA                |
| Hubbell, Bryan       | EPA                |
| Jacobs, Jeremy       | Greenwire          |
| Kaushik, Surender    | EPA                |
| Kirrane, Ellen       | EPA                |
| Lassiter, Meredith   | EPA                |
| Macey, Kristin       | Health Canada      |
| McDow, Steve         | EPA                |
| Meachan, Connie      | EPA                |
| Murphy, Diedre       | EPA                |
| Orlin, David         | EPA                |
| Owens, Beth          | EPA                |
| Patel, Molini        | EPA                |
| Pekar, Zachary       | EPA                |

| <b>Name</b>          | <b>Affiliation</b> |
|----------------------|--------------------|
| Putzrath, Resha      | U.S. Navy          |
| Rice, JoAnn          | EPA                |
| Richmond-Bryant, Jen | EPA                |
| Ross, Mary           | EPA                |
| Smith, Travis        | EPA                |
| Stanek, Lindsay      | EPA                |
| Svendsgaard, David   | EPA                |
| Tennant, Ginger      | EPA                |
| Vandenberg, John     | EPA                |
| Vanderpool, Robert   | EPA                |
| Vinikoor-Imler, Lisa | EPA                |
| Walker, Yvonne       | U.S. Navy          |
| Walsh, Debra         | EPA                |
| Wegman, Lydia        | EPA                |
| Weinstock, Lewis     | EPA                |
| Wilkie, Adrien       | EPA                |
| Young, Brianna       | EPA                |